NOVAL SOLID ROCKET MOTOR GRAIN CONFIGURATION METHODOLOGY, ITS COMPUTATIONAL ANALYSIS & COMPARISON WITH STAR GRAIN CONFIGURATION

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Submitted by

Sarah Hafeez

Supervisor: Dr. M. Bilal Khan
Co-Supervisor: Dr. A. Q. Malik & Lt Col (R) Nadeem Ehsan

School of Chemical and Materials Engineering (SCME)
National University of Sciences and Technology (NUST)
NUST H-12 Campus Islamabad
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IN THE NAME OF ALLAH
THE BENEFICENT,
THE MERCIFUL

"Glory be to You, we have no knowledge except what You have taught us,
Verily it is You, the All Knower , All Wise"

(Al-Quran 2-32)

Dedicated to

My loving husband, my son
&
my family

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Abstract

The research work conducted herein addresses mathematical modeling & computational of Novel Solid Rocket Motor grain configuration. Grain design has always been a vital and integral part of SRM design. Based on required design objectives, SRM designer has many options available for selecting and designing the grain configuration. Many of the design may fulfill the required parameters of volumetric loading fraction, web fraction, length to diameter ratio etc; produce internal ballistic results that may be in accordance to design objectives. Now a day's Star grain configuration is the best option in SRM. But still this configuration has many drawbacks. This design was proposed in 1935.

This thesis contains knowledge from history of SRM grain configurations to the most popular SRM grain configuration (Star) .The research work, a mathematical methodology has been presented for designing "Petal" grain configuration (novel grain configuration) for SRM. The main focus is to produce the best possible "Petal "grain configuration, which will be better than "Star" grain configuration. The design process of "Petal" grain configuration involves the mathematical modeling of the geometry of both configurations. The design computation has been executed by using ballistic / propulsion mathematical laws in Mat lab. After that different graph such as Thrust-Time graph, Burn area-Time graphs, Pressure-Time graphs, Port area –Time graphs are received as out put. These graphs are very important for both configuration as by comparing them it will be easy to know which configuration is better then other.

Mathematical modeling done in this thesis is basic and logical. Our proposed model and existing model are compared, and then their different contours are configured to get burn areas. This is the key point in generating different graphs for both configurations. This thesis is a beginning regarding this topic, with the passage of time new dimensions will open in this topic. However, the new "Petal" design unveils elimination of unwanted "sliver", which have been a constant pain in the neck in STAR grain design.